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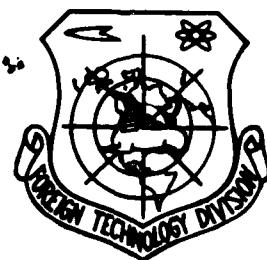
FOREIGN TECHNOLOGY DIVISION



STUDYING THE EFFECT OF AN AZNII-10 ADDITIVE ON
STABILITY AND ANTIWEAR PROPERTIES OF OILS

by

A. M. Kuliyev, I. M. Orudzheva,
and P. S. Mamedova



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STUDYING THE EFFECT OF AN AZNII-10 ADMIXTURE
ON STABILITY AND ANTIWEAR PROPERTIES OF OILS

By: A. M. Kuliyev, I. M. Orudzheva, and
P. S. Mamedova

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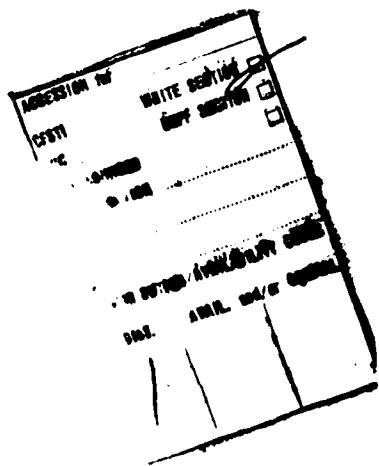
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ABSTRACT: The additive AzNII-10, a product of the condensation of 2,2'-dihydroxy-5,5'-di-tert-amylidiphenyl-sulfide with di-tert-amylphenyl-sulfide with di-tert-amylphenoxy the phosphoryl chloride improves by 10% the stability and the antiwear and tear properties of aircraft motor transformer, diesel and synthetic oils.
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STUDYING THE EFFECT OF AN AZNII-10 ADMIXTURE ON STABILITY
AND ANTIWEAR PROPERTIES OF OILS

A. M. Kuliyev, I. M. Orudzheva,
and P. S. Mamedova

Sulfur-and phosphorus containing compounds found broad application in role of admixtures to oils. Admixtures, containing phosphorus in its composition, possess the ability of raising stability, to improve the lubricating and other properties of lubrication oils.

In direction of synthesizing sulfur-and phosphorus containing compounds many investigations have been carried out by Soviet scientists.

A majority of sulfur-and phosphorus containing compounds appears to be reaction products of alcohols and alkylphenols with pentasulfuric phosphorus [1, 2, 3].

Our task was to obtain an admixture for the purpose of approving the exploitation properties of special petroleum and synthetic oils.

For that purpose was synthesized a new [AzNII-10] (АзНИИ-10) admixture, representing a condensation product of sulfidealkylphenol with chloroanhydride of alkylphenolphosphoric acid [4].

To obtain an AzNII-10 admixture was used para-tertiary amylphenol, synthesized by alkylation of phenol with iso-amyl alcohol in the presence of 98%-sulfuric acid.

Alkylphenol after flushing to neutral reaction was subjected to recrystallization in a dearomatized ligroin solution at a temperature of 0°C. With the use of para-tertiary amylphenol were synthesized 1.1' dioxy-4.4' ditertiaryamyl-diphenyl-2.2' sulfide and di'tertiary amylphenoxychloroanhydride phosphorous acid.

Table 1. Results of Testing Oils with Admixtures on a Fourball Apparatus

Name of oils	Name of admixtures	Amount of admixture %	Value of maximum load P_k	Pressure on lubrication film at moment of applying load equal P_k , P_m	Strength value of film kg/mm^2
Aviation oil MK-22	—	—	57	25700	16100
The same Aviation oil MC-20	AзНИИ-10	3	107 54	31800 25300	18100 13400
The same Aviation oil MK-8	AзНИИ-10	3	121 31	33100 21100	20100 10150
The same	AзНИИ-10	0.5	134	26200	18200
The same	Hexachloroethane	5	83	29000	18100
The same	Trichloro-cresylphosphite	5	83	29000	13300
The same Synthetic oil 36/1	HАММ-117	5	89	29000	13300
The same	AзНИИ-10	3	108	24400	18000
The same	The same	0.5	108	24400	18000

By condensation of these compounds was obtained an AзНИИ-10 admixture.

An analysis of para-tertiary amylphenol, intermediate synthesis products and AзНИИ-10 admixture has shown, that these compounds are individual products.

Investigations have shown, that the AзНИИ-10 admixture dissolves well in less viscous deeply purified petroleum, as well as synthetic oils. It was also established, that the AзНИИ-10 admixture exerts a slight effect on the physico-chemical properties of oils.

Investigated was the effect of AзНИИ-10 admixture on antiwear properties of oils, as well as on stability.

For investigation were taken oils - aviation [MK-8] (MK-8), [MS-20] (MC-20) and MK-22, transformer, diesel, as well as synthetic oils.

Table 2. Effect of AzNII-10 Admixture on Stability of Transformer Oil when Testing by VTI Method (Oxidation of Air)

Name of product	Amount of admixture, %	Analysis of oxidized oil	
		Acid number mg KOH	Residue %
at 120°C			
Transformer oil		0.18	0.075
The same + addition АзНИИ-10	0.05	0.06	0.021
	0.10	0.01	0.024
	0.3	0.22	0.05
The same + addition ionol	0.3	0.01	0.012
The same + addition paraoxidesphenolamines	0.02	0.07	0.04
at 150°C			
Transformer oil		0.98	1.20
The same + admixture АзНИИ-10	0.1	1.02	0.85
	0.3	0.13	0.28
The same + admixture ionol	0.5	0.37	0.35
at 170°C			
Transformer oil		3.86	2.57
The same + admixture АзНИИ-10	0.3	1.45	1.00
The same + admixture ionol	0.5	3.39	2.48

In Tables 1, 2, 3, and 4 are given results of testing oils with an AzNII-10 admixture. The stability of the oils was determined by the [VTI] (ВТИ) and AzNII method.

The data in Table 1 show, that at the addition to oils of AzNII-10 admixture in amount of 0.5% considerably improve their antiwear properties.

Examining the data, given in Tables 2, 3, and 4 it can be seen, that the AzNII-10 admixture raises the stability of transformer oil, diesel oil, and synthetic oils.

The AzNII-10 admixture exerts a positive effect on the stability of transformer oil during oxidation at a temperature of 120°C and over.

The addition of AzNII-10 admixture to oil, containing AzNII-7 and [SB-3] (СВ-3) admixtures does favorably affect the stability of this oil.

Data in Table 4 show, that synthetic oils with an AzNII-10 admixture possess fine anticorrosion and antiscale properties.

Table 3. Stability of Diesel Oil in Mixture with Admixtures.

Name of product	Amount of admixture	Analysis of oil oxidized by method BTI (160°C 14 hours)		Results of oxidation by АЗНИИ method, min	
		Acid number, mg KOH	Residue %	Induction period	Time of absorbing 20 ml of oxygen
Diesel oil	—	1.75	0.18	10	180
The same + admixture АЗНИИ-7	5	1.75	0.50	7	251
Diesel oil + admixture АЗНИИ-7 and АЗНИИ-10	5 + 0.5	1.26	0.08	10	293
Diesel oil + admixture СВ-3	10	3.99	0.29	9	87
The same + admixture АЗНИИ-10	10 + 0.5	1.65		7	243
Diesel oil + admixture АЗНИИ-10	0.1	—	—	15	262
	0.5	—	—	18	260
	1.0	—	—	15	247

Table 4. Studying the Effect of АЗНИИ-10 Admixture on Stability and Corrosion-Ability of Synthetic Oil

Name of product	Acid number, mg KOH		Residue %	Corrosion	
	before testing	after testing		2 g/m ²	outer form of plates
Synthetic oil	0.56	6.9	0.04	-8.8	corrosion
The same + 1% admixture АЗНИИ-10	0.94	5.1	0.04	0	no corrosion

The above given data allow to indicate, that an AzNII-10 admixture appears to be an effective admixture, having the ability of raising stability, anticorrosion, antiscale and antiwear properties of oils.

Positive results were obtained when testing synthetic oil in a mixture with AzNII-10 admixture. In this case it was noticed, that the AzNII-10 admixture exerts a favorable effect on antiscale properties of the oil.

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